SCIENCE NEWS

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SOLAR MAGNETISM

CLOSE relations between events on the sun and conditions on earth, due in part to the magnetic nature of both great globes, were traced in the Arthur Lecture, delivered on February 26 at the Smithsonian Institution by Dr. John A. Fleming, director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington.

The sun, Dr. Fleming pointed out, is a vast sperical magnet, on the same essential pattern as the earth, except of course that it is much larger. Force of its surface magnetic field is also much greater—about 100 times as intense as the earth's.

The magnetic poles of the sun resemble those of the earth in not being located exactly on the rotational poles. The eccentricity is not so great on the sun, however; its north magnetic pole is only four degrees removed from its north rotational pole, whereas the earth's magnetic north pole and rotational north pole are 11.5 degrees apart.

The sun's magnetism does not directly affect the magnetic field of the earth. Despite its hundred-fold greater magnitude, it is still too feeble to produce noticeable changes so far away. The great magnetic storms that sweep about the earth from time to time, almost always accompanied by auroral displays, are directly traceable to streams of electrical particles poured through space; these grow greater and less in step with changes in solar magnetism.

Magnetic storms, it should be pointed out, are not related to electrical storms or other visible and audible disturbances in the earth's atmosphere. These are relatively local affairs, whereas the great magnetic storms are world-wide, and are utterly silent and imperceptible to human senses. They make themselves evident mainly through their disruptive effects on wired and wireless communications when they are at their height.

Auroras, the only visible effects or concomitants of magnetic storms, are relatively remote affairs. Whereas the highest clouds of "weather" storms are only a few miles up, the lowest of the polar lights that have ever been measured have had altitudes of about 50 miles, and they range from that up to 300 miles.

"GALLOPING GERTIE" BRIDGE

"GALLOPING Gertie," bridge over the Tacoma Narrows in Washington State, bounced up and down to the extent of making some people sea-sick and finally collapsed. The bridge bounced up and down even though the wind was steady and horizontal.

This curious behavior has at last been brought to leash under the most severe mathematical formulae and probably won't happen again. The restraining formulae have been supplied by Professsor Norman Levinson, of the Massachusetts Institute of Technology, and were reported on February 28 to the American Mathematical Society meeting at Columbia University.

This perversely vertical vibration, at right angles to a steadily blowing wind, is but one instance of many other examples of the same sort which until now have defied mathematical analysis. Other instances, Dr. Levinson mentioned, are the flapping of a flag in a breeze, the vibration of a violin string when bowed, the singing of wires in the wind, the sound issuing from a bottle when one blows across the mouth. They are called "relaxation oscillations."

They occur also in electrical systems containing radio tubes, and this case was investigated mathematically some twenty years ago by the Dutch engineer Van der Pol, and again in 1927 by a French engineer, Lienard. But this is a very restricted field.

Much more general equations have now been developed by Dr. Levinson, applicable to a great variety of mechanical and other situations. In particular, he has found the conditions under which these relaxation oscillations will be kept within narrow safe limits. Also he has found the conditions under which from among several possible modes of oscillation only one will occur in response to the disturbing cause. Such a system will never be at rest but the engineer can so design the structure that the oscillations can never become very great.

SUBSTITUTE DRUGS

THE first substitution of a domestic medicinal drug for one imported before the war has been authorized by the National Formulary and the U. S. Pharmacopoeia. The National Formulary authorizes the substitution of extract of stramonium for extract of belladonna in compound pills of cascara.

Other alterations in drug preparations authorized by the Formulary have so far been of a non-medicinal character. For example, permission is given to omit rose water, once imported from France, from cold cream. Use of distilled water in cold cream instead of rose water, and substitution of persic oil, made from peach and almond kernels, in place of almond oil, are also now permissible.

As a result of the shortage of oil of lavender, the U. S. Pharmacopeia has authorized its omission in aromatic spirit of ammonia and the substitution of oil of cedar leaf for oil of lavender in tincture of green soap. Because of the scarcity of Mediterranean squill, an expectorant used in cough medicine, the Pharmacopeia has recognized a variety of this drug which can be imported from India, *Unginea indica* Kunth. Ergot, used to prevent hemorrhage in the mother after child birth, may now be imported under less rigid packaging requirements, provided it is dried, assayed and repackaged immediately after entry. Ergot comes from Russia and Spain. Amaranth, a red coloring derived from coal tar, may now be substituted for tincture of cudbear, standard red coloring, once imported from Holland. Benzaldehyde is authorized by the Formulary as a substitute for oil of bitter almond, as flavoring agent in official preparations.

THE EIGHT-HOUR DAY

LONGER working days may result in decreased output, despite eagerness on the part of both management and workers to rush war production, is indicated by a review of previous experience especially by the British.

With a tremendous incentive such as the war gives to American workers, men can greatly step up their production and working hours for a short period without any breakdown resulting. But if this pace is kept up for any length of time production drops off, sickness and accidents increase and a "staleness" or lack of morale results. Just how long a man's or a woman's working day should be for maximum production depends on the type of work, on the make-up of the individual and also upon social conditions inside and outside the plant.

British industrial authorities have found fifty-six working hours a week to be best for their men. This would amount to five 10-hour days with a 6-hour day on Saturday and with Sunday off. After a trial of longer hours at the beginning of the war, hours in England have been cut to 48 a week for women and from 54 to 60 for most men. Even in Germany an initial trial of longer hours gave way to a restoration of the eight-hour day. The one rest day in seven recommended in the Bible is still found to be essential for retaining working efficiency in the new World War. Enforced rest periods with an opportunity to take food assist in keeping up the output.

In the United States where workers may have been geared to higher production rates and more intensive production methods, the optimum hours should very likely be lower than has been found best for British workers.

Dr. A. C. Ivy, of Northwestern University Medical School, points out in a report appearing in the *Journal* of the American Medical Association, that physical demands placed on the body by labor govern the length of time a worker can stand up under the strain without rest.

Heavy muscular work uses energy at from three to eight times the basal rate. Such work includes many of the heavy manual jobs in agriculture, building trades, mining, heavy industry and forced marches with a heavy load. This sort of work, Dr. Ivy says, can be maintained for eight hours. But the man putting in eight hours or more of this sort of work must have much more to eat and extra vitamins, and possibly extra water and salt. Supervised rest periods are important.

Most factory and office work comes in the class of moderate muscular work which leaves the worker at the end of the day anxious to spend more energy in gardening, ball games or dancing. This does not mean that there is no fatigue. Much factory work, Dr. Ivy points out, involves the use of special or small groups of muscles. Fatigue from this sort of work is hard to measure but nevertheless cuts down output.

Timing is usually the first thing to go wrong when workers at highly skilled tasks are fatigued, it has been pointed out by Professor F. C. Bartlett, the British psychologist. It is also difficult, he found, for workers fatigued at complex tasks to keep their attention on details not closely organized with the main part of their work. At scientific work, the British found that very little more was accomplished in a 66-hour, seven-day week than had been done in the peace time week of 44 hours.—MARJORIE VAN DE WATER.

ITEMS

PAINT that glows in the dark would be used on all walls of factories that may have to be blacked out if the suggestions of Dr. Gorton Fonda of the General Electric Research Laboratory are put into effect. Phosphorescent materials would be painted on the walls. These store up energy when the lights are shining and give it off for a short while when illumination stops. When the blackout comes the walls would continue to give off a faint ghostly glow for a short time during which the workers' eyes would become adapted to the darkness. This would also give time for the workers to find their way to their emergency posts.

EYE injuries to American workmen occur roughly twice every minute and add up to a cost of $100,000,000 every year to American industry while the total number of workmen with impaired vision amounts to 75,000 a year. These estimates were given by Dr. John R. Wittekind, of Morrisville, Pa., to the opening sessions of the thirteenth annual convention of the Greater New York Safety Council. Dr. Wittekind said even a minor eye injury costs $14.60 through lost time and production, and added that one out of every four eye injuries results in permanent partial loss of vision. He said nearly 98% of all eye injuries are preventable, and that many injuries now are actually being prevented by the increasing use of safety glasses and goggles.

ORDINARY spool cotton available in any dry goods store can replace silk in sewing up all types of wounds requiring interrupted stitches, according to a report in the current issue of the *Journal* of the American Medical Association. Dr. William H. Meade, East Lansing, Mich., and Dr. Carroll H. Long, Tulane University of Louisiana School of Medicine, report that cotton was used routinely for eighteen months in approximately 1,800 cases at Charity Hospital, New Orleans. They assert that cotton was tolerated better by body tissues than silk and can be used more safely in the presence of infection. "It was clearly demonstrated," their report continues, "that whereas dry, unsterilized cotton has less tensile strength, size for size, than catgut, silk or linen, its tensile strength is less altered by sterilization than is that of other suture materials."

EXPECTING a shortage of steel, many states are considering issuing future automobile license plates for two or more years, according to information received from the American Automobile Association. Michigan is considering two years, Connecticut, five years, and even a permanent license plate has been proposed. Each year, according to one plan, a small strip of steel showing the new year number would be bolted over the old number. Another plan is to substitute paper stickers for the plates. Use of a plastic in place of steel has not been considered because there is also a shortage of plastics. Painting over the old plates must also be discarded because such painting would cost about eight cents against two to three cents for new plates.